The GOES-R Proving Ground

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(US representative to the WMO WWRP Nowcasting Working Group)

NOAA Testbed USWRP Workshop

Boulder, CO

April 28-29, 2009

http://www.goes-r.gov

Contributors

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Outline

- ## GOES-R Proving Ground Overview
  - Mission, Components, Framework
  - Organization, Partners

- ## Progress and Status

- ## Some Examples

- ## Summary

Proving Ground Mission Statement

The GOES-R Proving Ground engages NWS in pre-operational demonstrations of selected capabilities of next generation GOES

- Objective is to bridge the gap between research and operations by:
  - Utilizing current systems (satellite, terrestrial, or model/synthetic) to emulate future GOES-R capabilities
  - Infusing GOES-R products and techniques into NWS operations with emphasis on AWIPS and transitioning to AWIPS-II.
  - Engaging in a dialogue to provide feedback to developers from users

- The Proving Ground accomplishes its mission through:
  - Sustained interaction between developers and end users for training, product evaluation, and solicitation of user feedback.
  - Close coordination with GOES-R Algorithm Working Group (AWG) and Risk Reduction programs as sources of demonstration products, promoting a smooth transition to operations

Intended outcomes are Day-1 readiness and maximum utilization for both the developers and users of GOES-R products, and an effective transition to operations

GOES-R Proving Ground

- – Place where technologies and ideas are tested and proven before being fielded in operations
- – Evaluates how infusion of technology or process in forecast environment impacts operations
- – Integrates technology or process with other available tools
- – User readiness risk mitigation
- – Key component: operational testing by those independent of the development process
- – Key Benefit: users more accepting of fielded technology
  - • They have had a say in the design
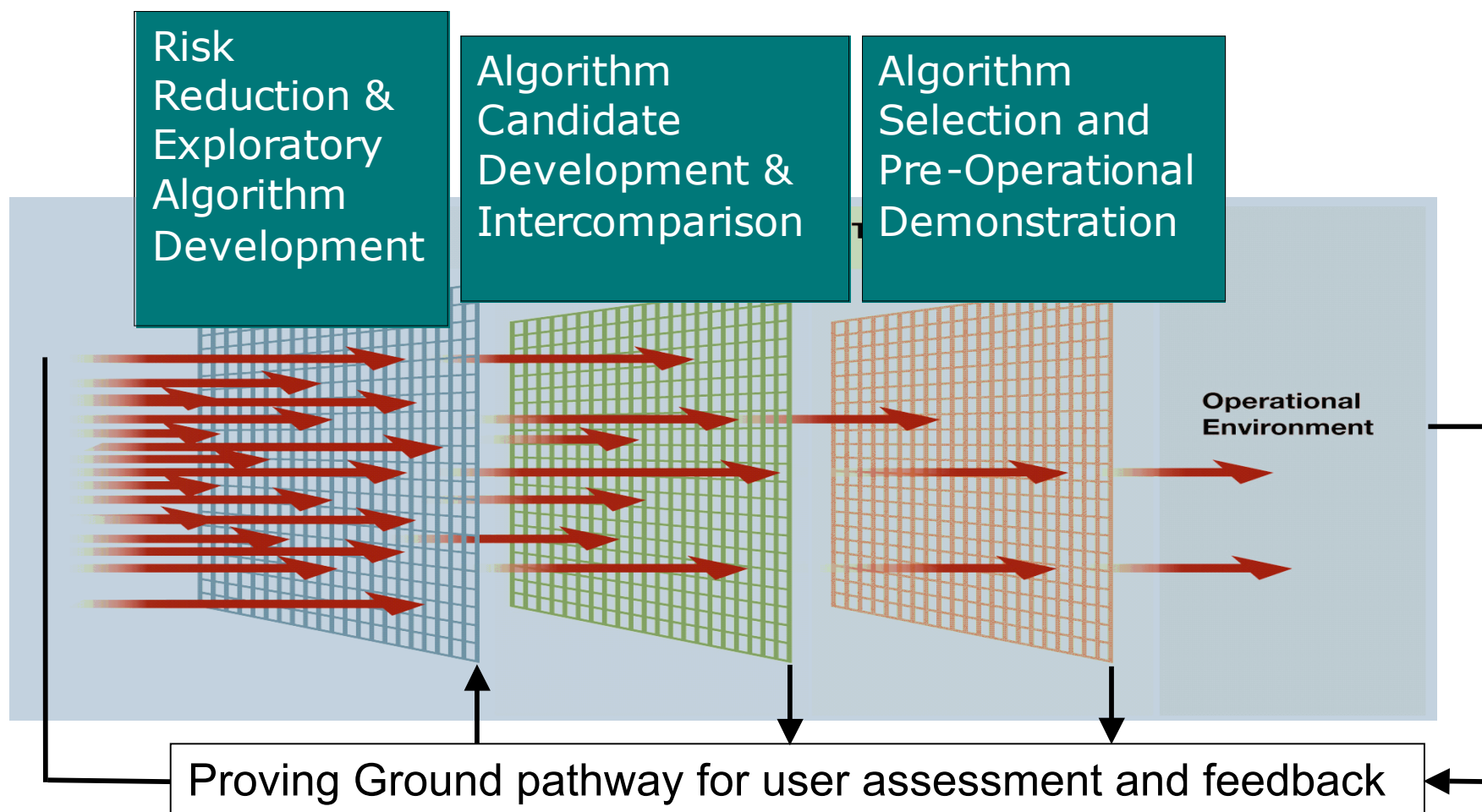 - • Design better fits an identified need

Key Components of Proving Ground

- Ability to fully test individual components
- Ability to fully test integrated components
- Testing which simulates routine low-end events
- Testing which simulates high-end non-routine events
- Testing using archived events and simulation
- Testing using live events
- Test team independence
- Test team membership made up of test experts, trainers, and operational users
- Ability to make recommendations to the decision maker based on impacts noted in test findings

GOES-R Program Risks: User Readiness

Rank	Risk ID	Risk Statement (Condition; Consequence)	Approach/Plan	Status **Mitigation**
3	**GP0-33**	**GOES-R User Readiness**	**Mitigation**	GOES-R User Readiness Plan to consolidate and document all user interface & readiness activities and coordination.
Criticality	**Planned Closure**	**If** user or NOAA infrastructure upgrades necessary to ensure compatibility with GOES-R are not adequately identified, prioritized, developed, and funded to coincide with planned deployment schedules;	✓1. Interface Requirements Definition & Coordination ✓a. Interface Requirements Docs (IRDs) (Aug. 2008)	Conferences, Workshops, and other forums will continue to be used to provide user community with information and transition planning
2x4 **M**	Long-Term	**Then**, there is a possibility that specific users will be unable to use the data products from lack of available infrastructure or from incompatibility with data distribution to meet increased performance needs resulting in schedule delays and cost impacts;	b. GOES-R User Readiness Plan Development & Approval (Sep. 2009) 2. External (to GOES-R) Orgs. (OSO, AWG, OSD) Communication & Collaboration from Design thru. Deployment 3. GOES-R Proving Grounds & User Community Training ✓4. User Community Outreach & Conferences 5. NOAA/User Orgs. Resources and Schedule Commitments	Major event being planned includes the PG Annual Meeting (May 2009) and GOES Users Conference (November, 2009) **GOES-R Proving Ground** concept is being initiated to allow for the research-to-operations. Focus is on forecaster/**AWIPS-2** to prepare for the GOES-R information, to get real-world experience by leveraging existing resources, and to evaluate product tailoring. Plan in development. Coordination with NOAA Testbeds (USWRP Workshop April, 2009). Initial plans in place for NOAA Hazardous Weather Test Bed (HWT) PG Spring Experiment Demonstration.
		Risk Owner: Steve Goodman		

GOES-R Proving Ground in the R2O Framework

As new ideas and algorithms are developed, validation, testing, and pre-operational assessments winnow the mature candidate list to the most promising algorithms that will be transitioned into operations.

Progress and Status of Proving Ground

- Kickoff Meeting held May 15-16, 2008 in Boulder, CO
  - Over 30 participants from GPO, AWG, CIMSS, CIRA, NWS HQ, FSL, OSD, OSDPD, SPoRT, and STAR
  - Web Site Established (cimss.ssec.wisc.edu/goes_r/proving-ground.html)
- Organization telecon held June 16, Monthly telecons on-going
  - Key message…for every product, tool or technique developed there must be a clear path to operational implementation
  - Executive Board and Advisory Team formed
  - NWS HQ and field fully engaged in plans and implementation
  - Satellite "Champion" hired at OU/CIMMS to support NWS user readiness (GOES-R funded)
  - Candidate products identified for 2009 Hazardous Weather Testbed Spring Experiment forecast and warning assessment
    - Convective Initiation (CIMSS)
    - Lightning rates, density, trends (SPoRT)
    - Probability of hail (CIRA)
- 2nd Annual Meeting May 15, 2009 at COMET in Boulder, CO
- Alaska Region/High Latitude PG Meeting Aug. 18-20, 2009 Fairbanks, AK

Proving Ground Organization

Executive Board:
Steve Goodman (Chair)- NESDIS/GOES-R Senior Program Scientist
Jim Gurka- NESDIS/GOES-R Ground Segment Project Scientist
Jaime Daniels-NESDIS/STAR/GOES-R AWG
Mark DeMaria-NESDIS/STAR/ GOES-R Risk Reduction
Tim Schmit-NESDIS/STAR/ASPB
Kevin Schrab- NWS

Advisory Team:
Tony Mostek-NWS/COMET
Russ Schneider- NWS/NCEP/SPC
Gary Hufford- NWS Alaska Region
Shanna Pitter- PPI, NWS WW Goal Team
Cecilia Miner- NWS, C&T Goal Team
Steve Miller- CIRA
Wayne Feltz-CIMSS
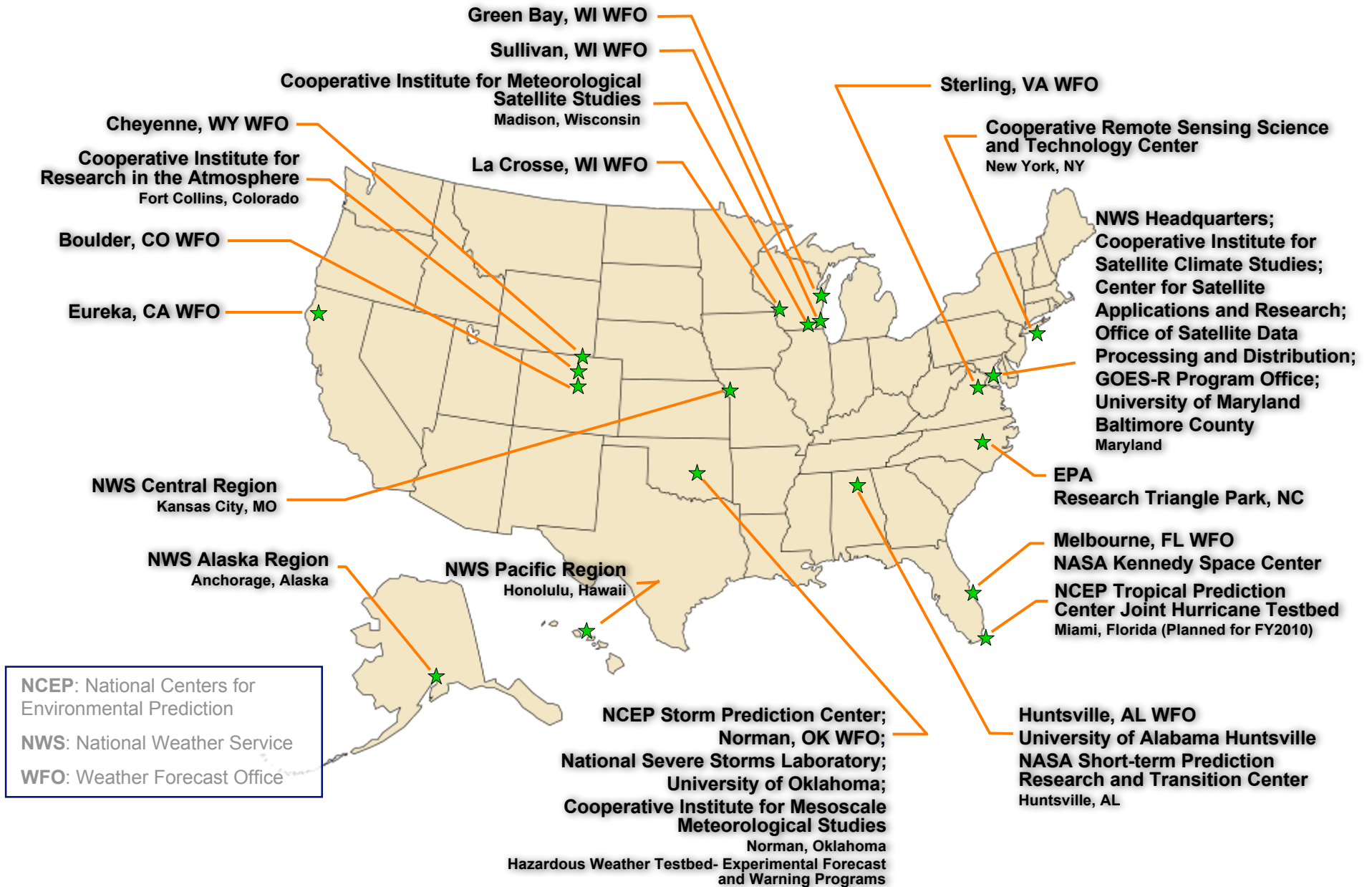Shobha Kondragunta-NESDIS/STAR AQ IPT
Gary Jedlovec-NASA SPoRT

GOES-R Product Set- 68

GOES-R 34 Baseline Products	GOES-R 34 Additional Products (Option 2)
Aerosol Detection (incl Smoke & Dust)	Aerosol Particle Size
Suspended Matter / Optical Depth	Aircraft Icing Threat
Volcanic Ash: Detection & Height	Cloud Ice Water Path
Cloud & Moisture Imagery	Cloud Imagery: Coastal
Cloud Optical Depth	Cloud Layers / Heights and Thickness
Cloud Particle Size Distribution	Cloud Liquid Water
Cloud Top Phase	Cloud Type
Cloud Top Height	Convective Initiation
Cloud Top Pressure	Enhanced "V" / Overshooting Top Detection
Cloud Top Temperature	Low Cloud and Fog
Hurricane Intensity	Turbulence
Lightning Detection: Events & Flashes	Visibility
Rainfall Rate / QPE	Probability of Rainfall
Legacy Vertical Moisture Profile	Rainfall Potential
Legacy Vertical Temperature Profile	Total Water Content
Derived Stability Indices	Absorbed Shortwave Radiation: Surface
Total Precipitable Water	Downward Longwave Radiation: Surface
Clear Sky Masks	Upward Longwave Radiation: Surface
Radiances	Upward Longwave Radiation: TOA
Downward Solar Insolation: Surface	Ozone Total
Reflected Solar Insolation: TOA	SO2 Detection
Derived Motion Winds	Flood/Standing Water
Fire / Hot Spot Characterization	Ice Cover/Landlocked
Land Surface (Skin) Temperature	Snow Depth
Snow Cover	Surface Albedo
Sea Surface Temperature	Surface Emissivity
Energetic Heavy Ions	Vegetation Fraction: Green
Magnetospheric Electrons and Protons: Low Energy	Vegetation Index
Magnetospheric Electrons and Protons: Medium & High Energy	Currents
Solar and Galactic Protons	Currents: Offshore
Geomagnetic Field	Sea & Lake Ice: Age
Solar Flux: EUV	Sea & Lake Ice: Concentration
Solar Flux: X-Ray	Sea & Lake Ice: Extent
Solar Imagery: X-Ray	Sea & Lake Ice: Motion

ABI	SUVI	EXIS
GLM	SEISS	Magnetometer

GOES-R Proving Ground Partners

Green Bay, WI WFO

Sullivan, WI WFO

Cooperative Institute for Meteorological Satellite Studies
Madison, Wisconsin

Sterling, VA WFO

Cheyenne, WY WFO

Cooperative Remote Sensing Science and Technology Center
New York, NY

Cooperative Institute for Research in the Atmosphere
Fort Collins, Colorado

La Crosse, WI WFO

Boulder, CO WFO

NWS Headquarters; Cooperative Institute for Satellite Climate Studies; Center for Satellite Applications and Research; Office of Satellite Data Processing and Distribution; GOES-R Program Office; University of Maryland Baltimore County
Maryland

Eureka, CA WFO

NWS Central Region
Kansas City, MO

EPA
Research Triangle Park, NC

NWS Alaska Region
Anchorage, Alaska

NWS Pacific Region
Honolulu, Hawaii

Melbourne, FL WFO
NASA Kennedy Space Center

NCEP Tropical Prediction Center Joint Hurricane Testbed
Miami, Florida (Planned for FY2010)

NCEP Storm Prediction Center; Norman, OK WFO; National Severe Storms Laboratory; University of Oklahoma; Cooperative Institute for Mesoscale Meteorological Studies
Norman, Oklahoma
Hazardous Weather Testbed- Experimental Forecast and Warning Programs

Huntsville, AL WFO
University of Alabama Huntsville
NASA Short-term Prediction Research and Transition Center
Huntsville, AL

NCEP: National Centers for Environmental Prediction

NWS: National Weather Service

WFO: Weather Forecast Office

"ABI" Proxy Data from Current Satellites
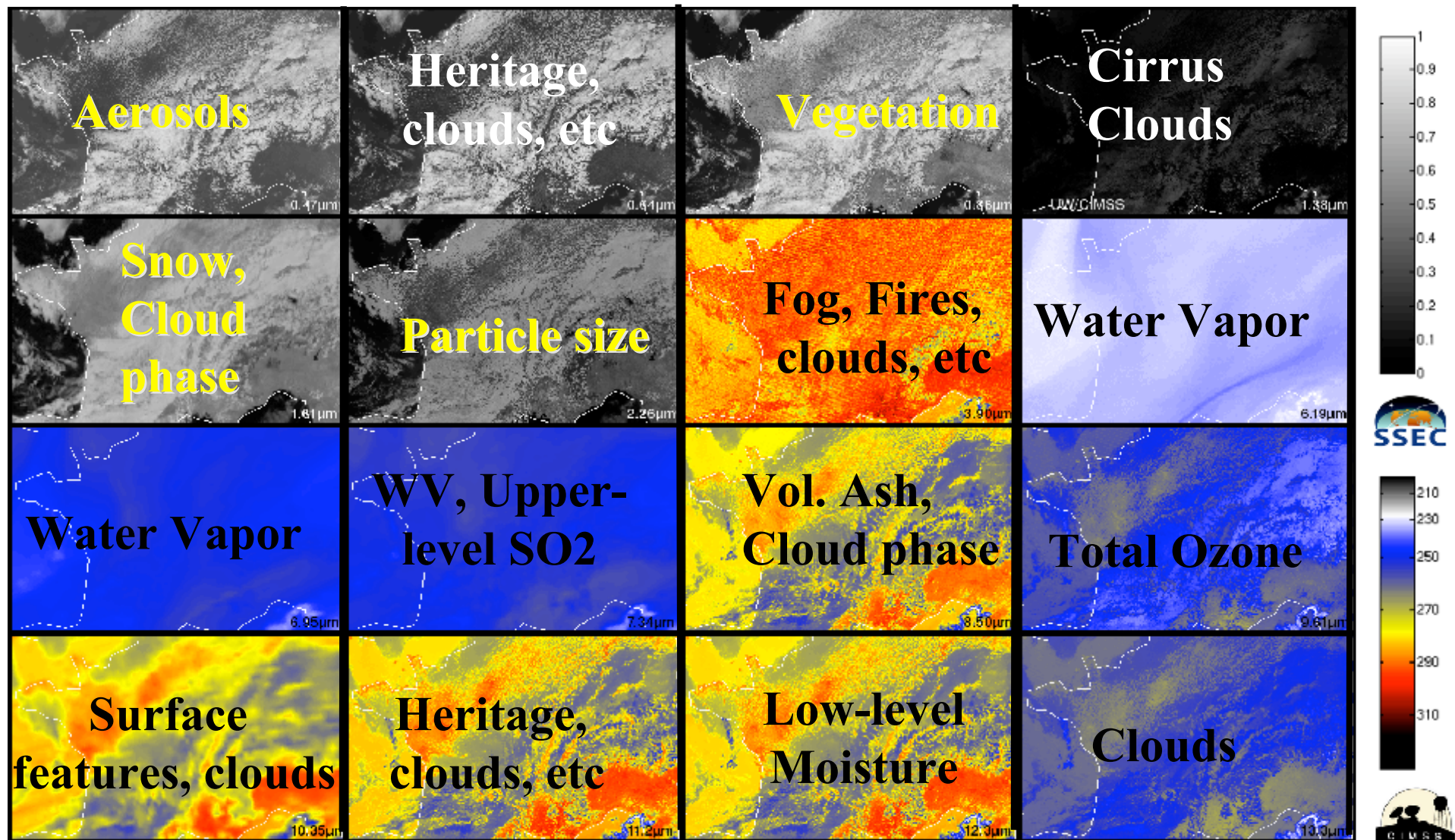
ABI Proxy from MODIS, MSG, and AIRS on 2004 April 11

AREA FORECAST DISCUSSION
NATIONAL WEATHER SERVICE
MILWAUKEE/SULLIVAN WI
159 PM CDT SUN AUG 17 2008

EVEN WITH THE WEST SURFACE WINDS
1622Z MODIS SHOWS WARM UPPER 60
DEGREE LAKE MICHIGAN TEMPS NEAR
SHORE...WITH NO COOLER UPWELLING
SEEN. WOULD HAVE THOUGHT TEMPS
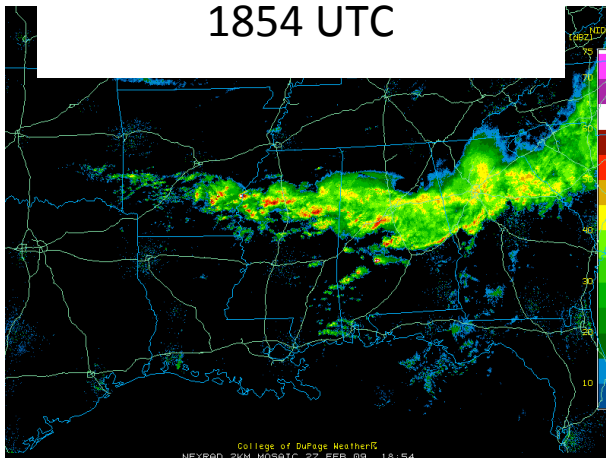WOULD HAVE BEEN COOLER...BUT WINDS
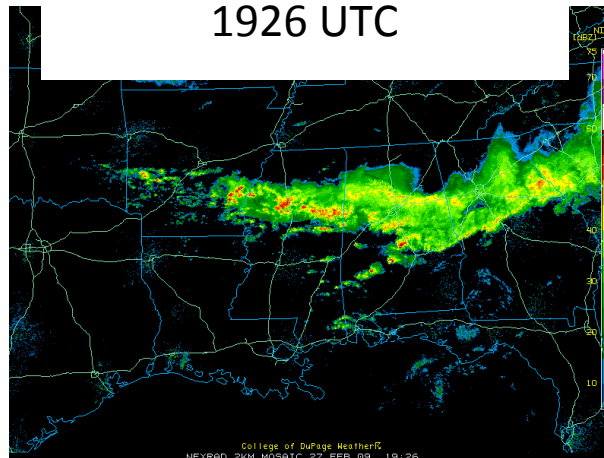ARE WEAK.
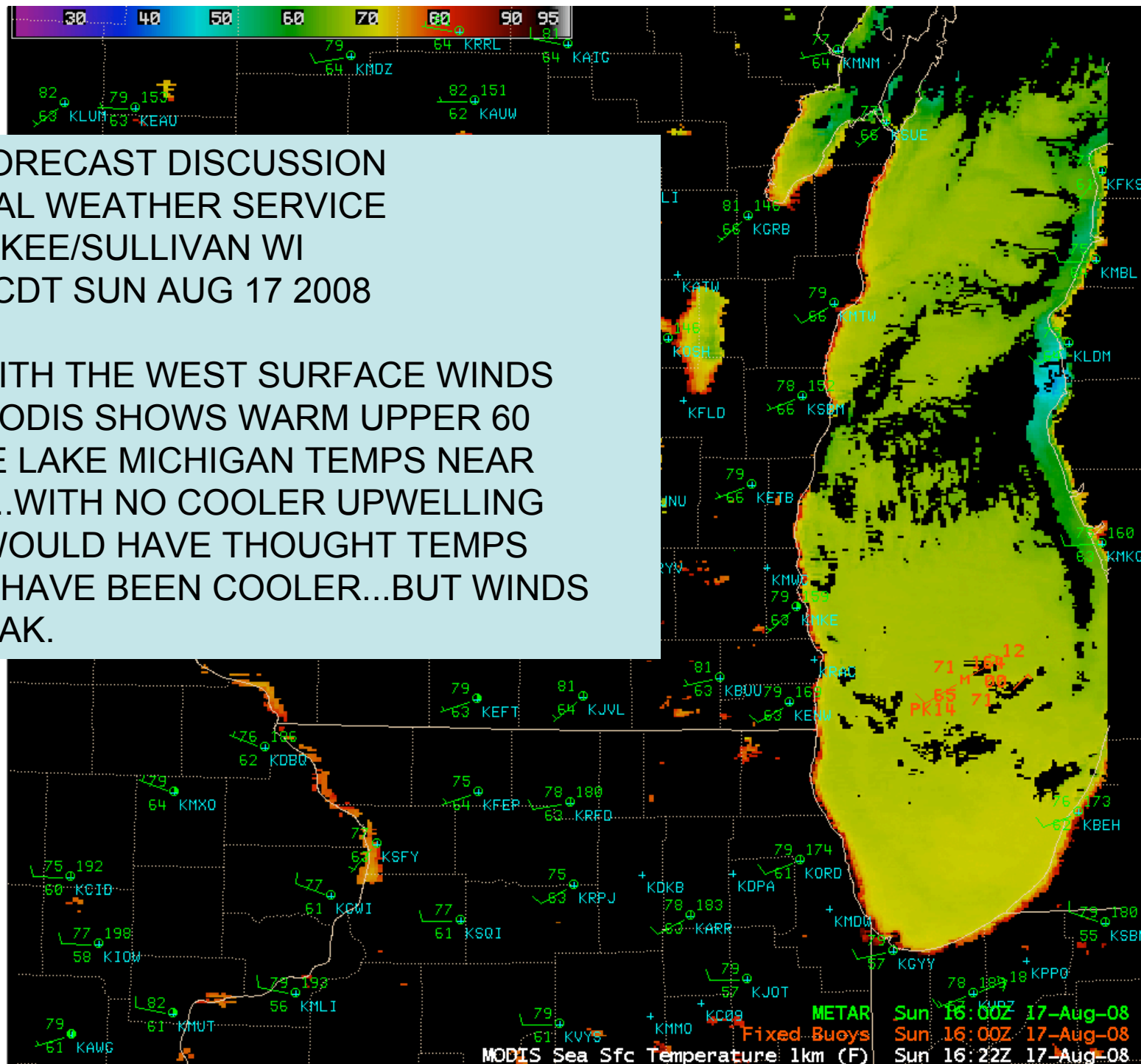
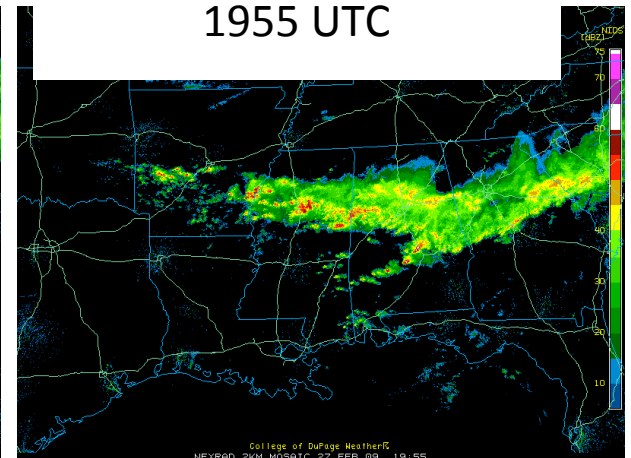# Convective Initiation (CI) Trend
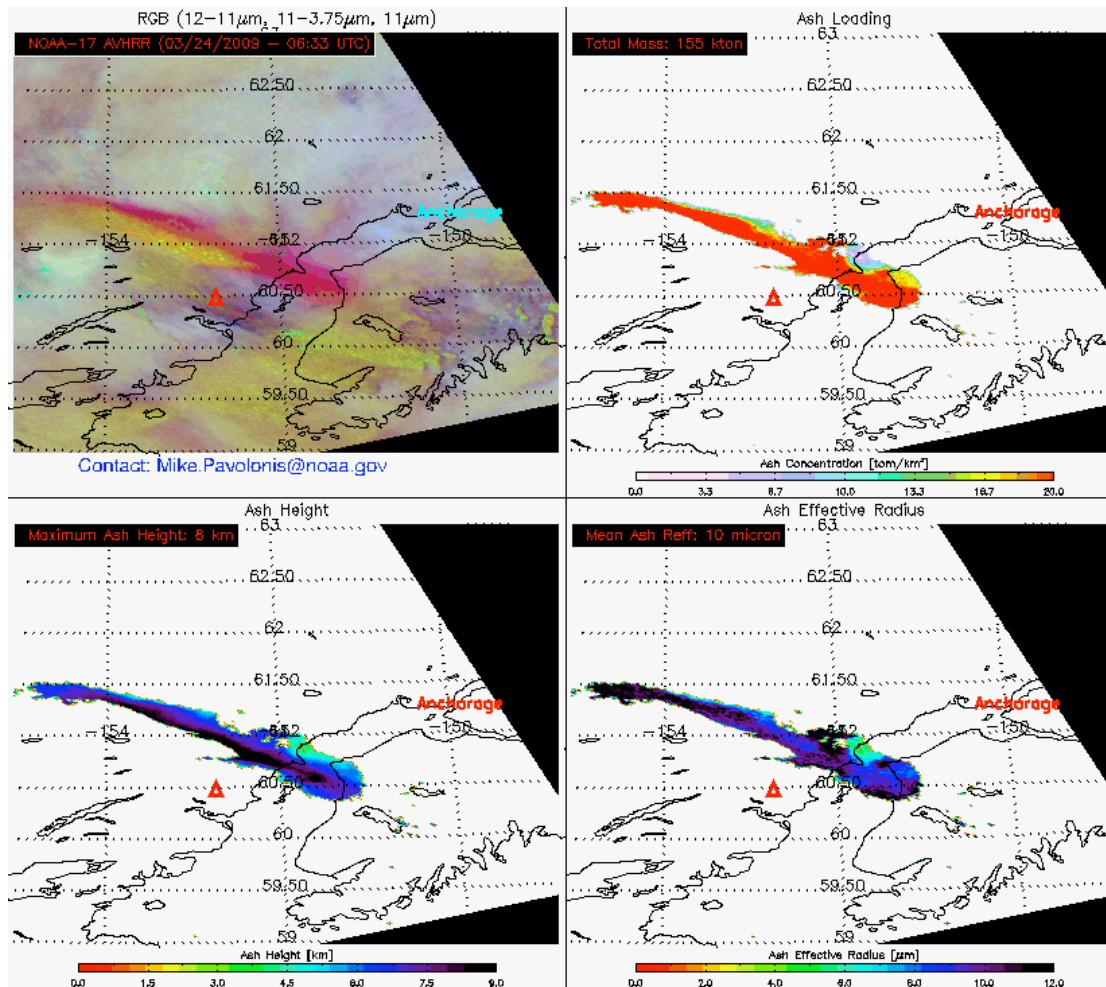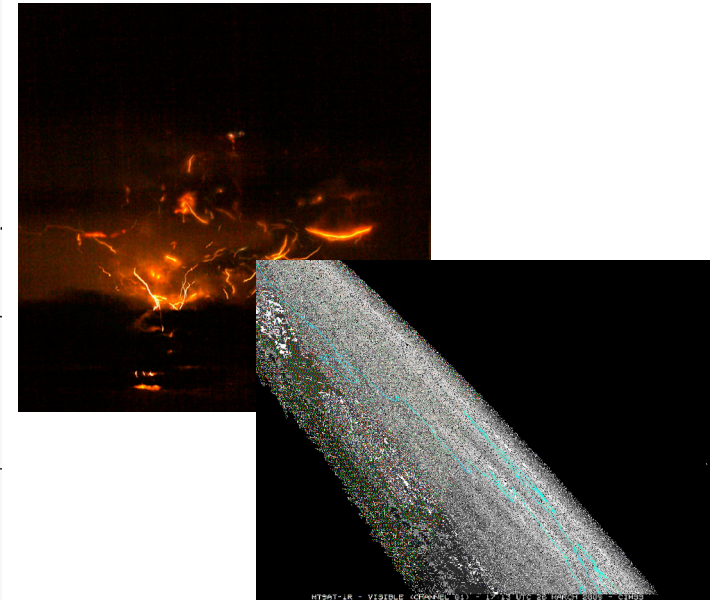
CI TREND: 20090227 at 1945 UTC
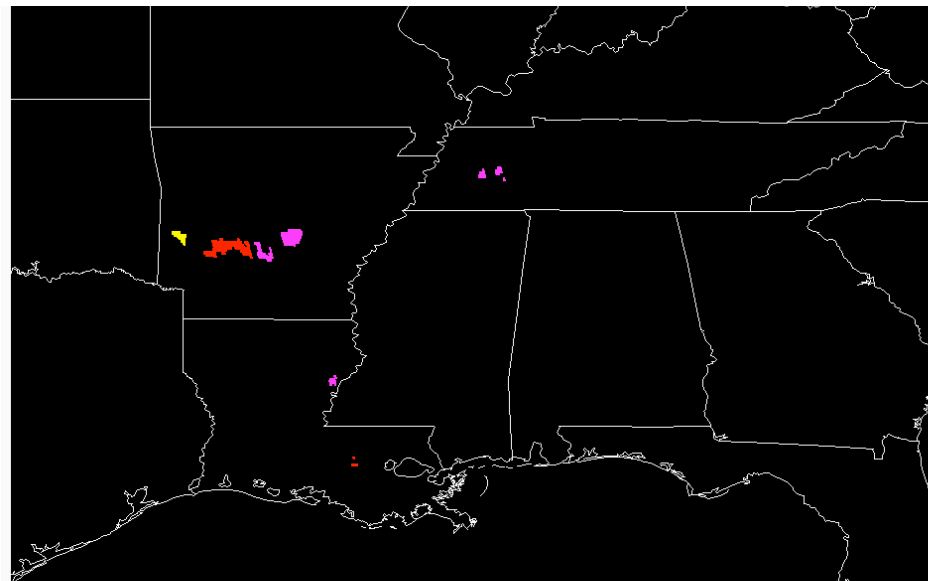
1854 UTC   1926 UTC   1955 UTC

Examples of Proving Ground Products

False-color RGB image along with 3 other volcanic retrieval products: Ash loading, Ash height, and Ash effective radius. *(produced by Mike Pavolonis, CIMSS/ASPB)*

Mt. Redoubt has had more than 20 major eruptions since Sunday morning March 22, 2009. The eruptions have created a continuous major ash plume that has disrupted aviation across the State of Alaska. Rapid scan products of GOES imagery provided new insight on the eruptive activity of the mountain. NWS forecasters were able to use this insight to provide better information for warnings and advisories issued to the public and aviation communities.

http://cimss.ssec.wisc.edu/goes/blog/archives/2228

Animation of sample ABI visible and near-IR bands in AWIPS
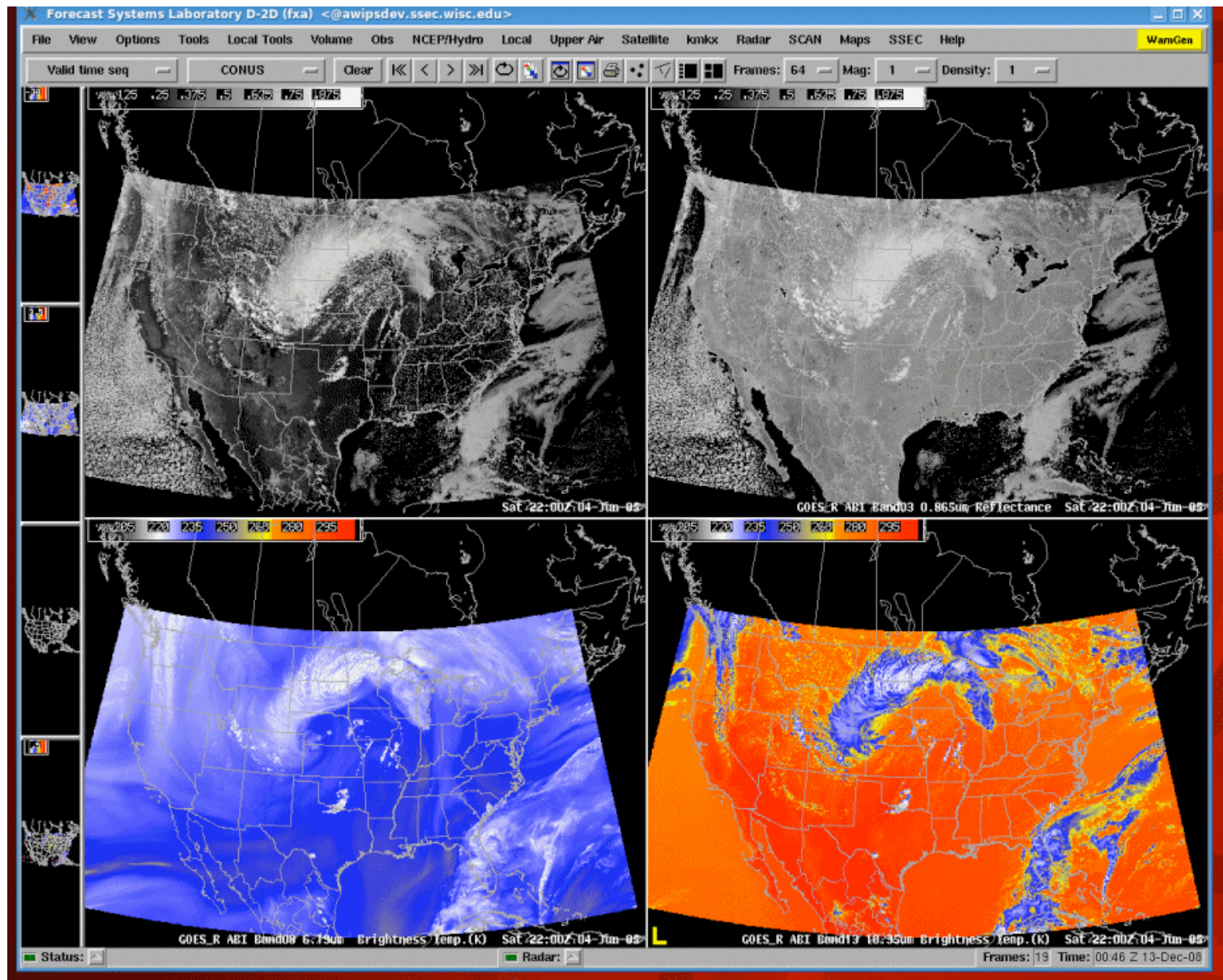
AWG Proxy ABI Simulations of Hurricane Katrina

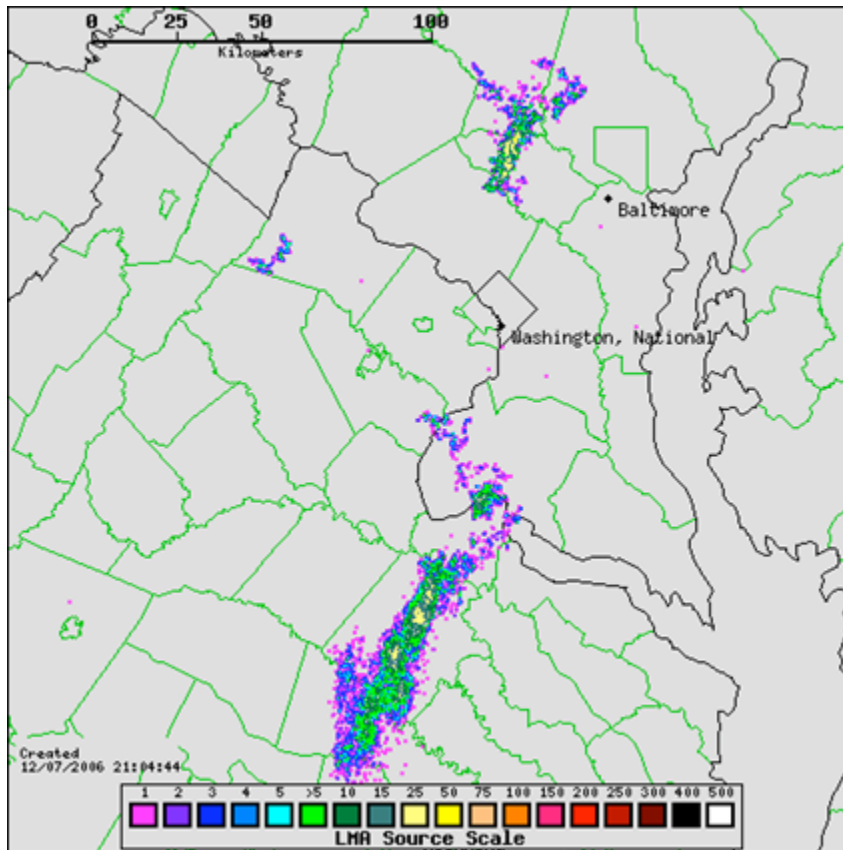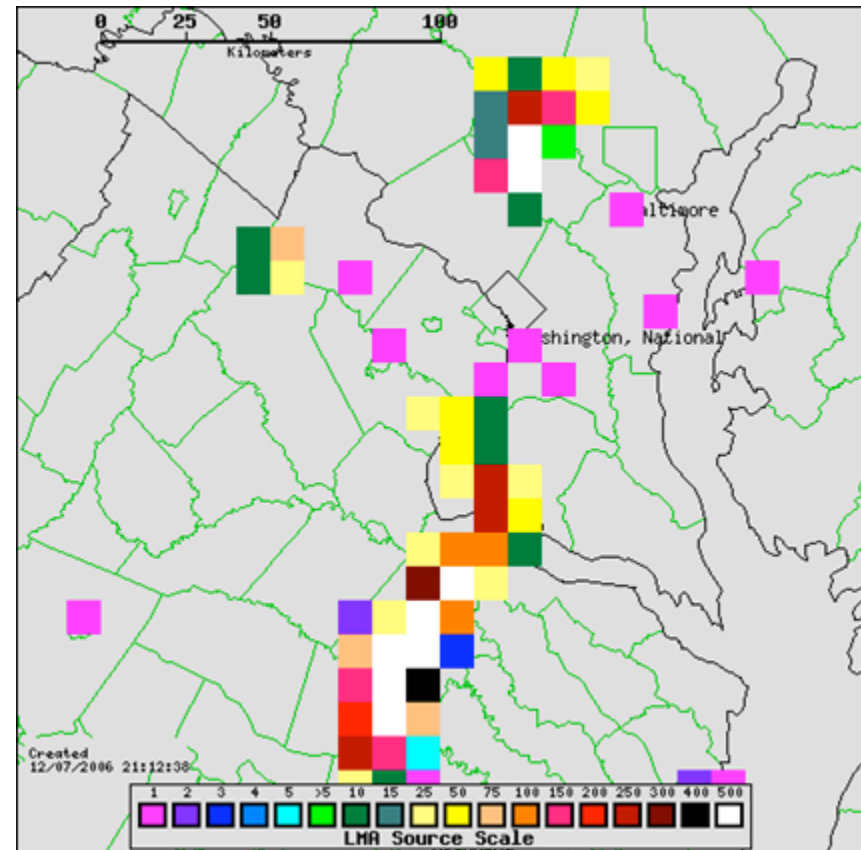NOAA/NESDIS STAR and GOES-R Imagery Team
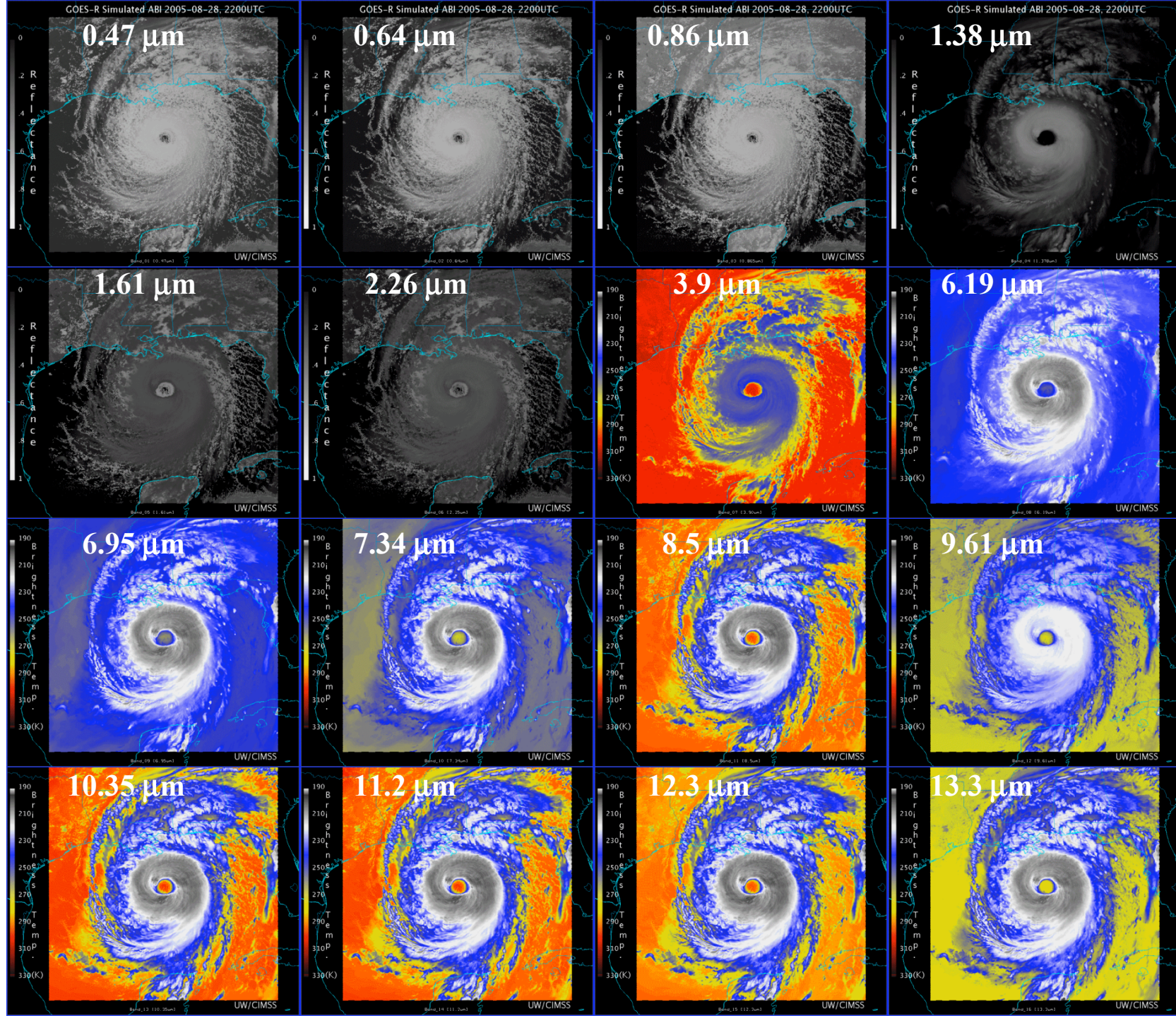
GLM Proxy Data
DC Regional Storms November 16, 2006
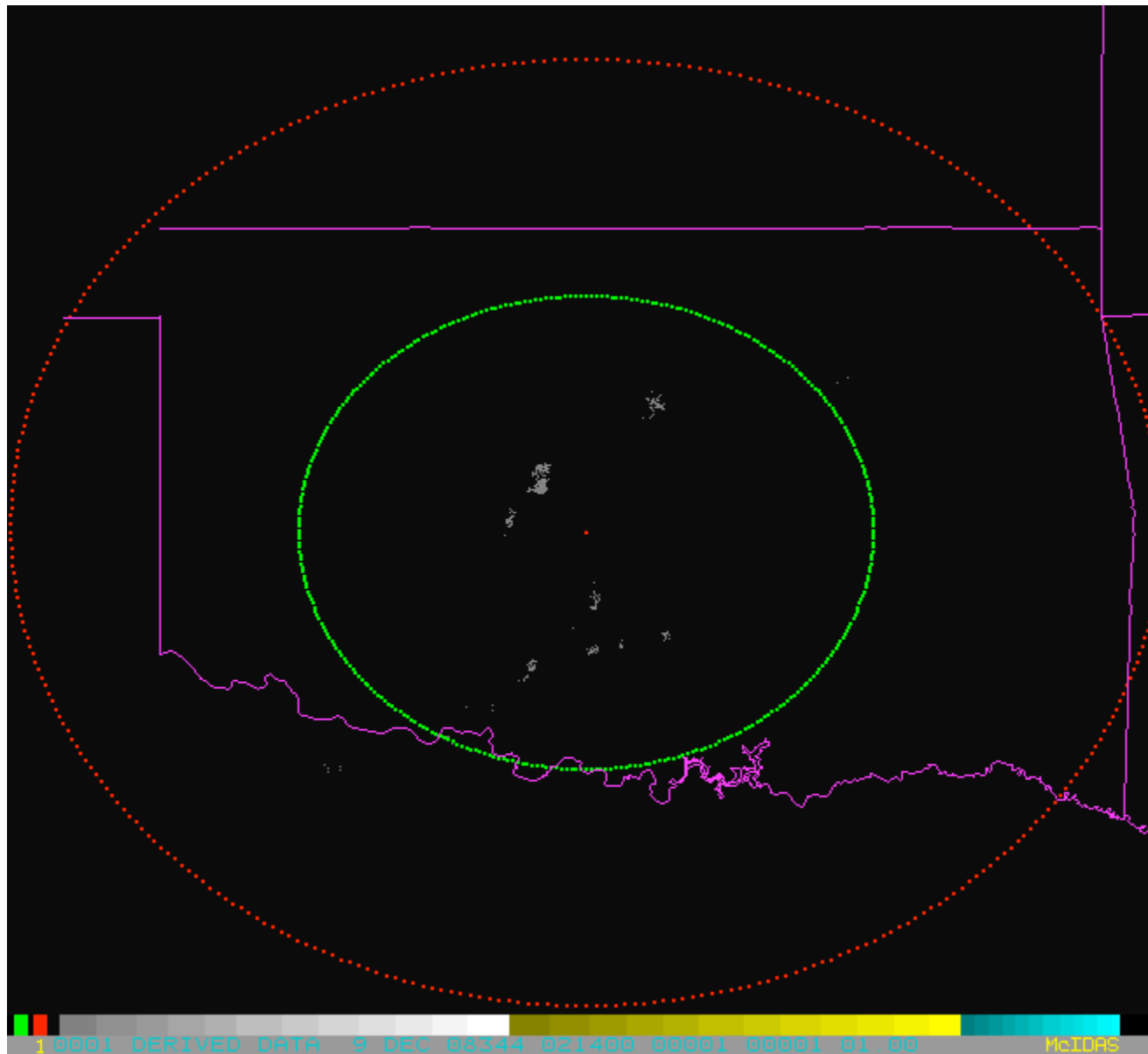## Resampled 5-min source density at 1 km and 10 km

LMA 1 km resolution

LMA @ GLM 10 km resolution

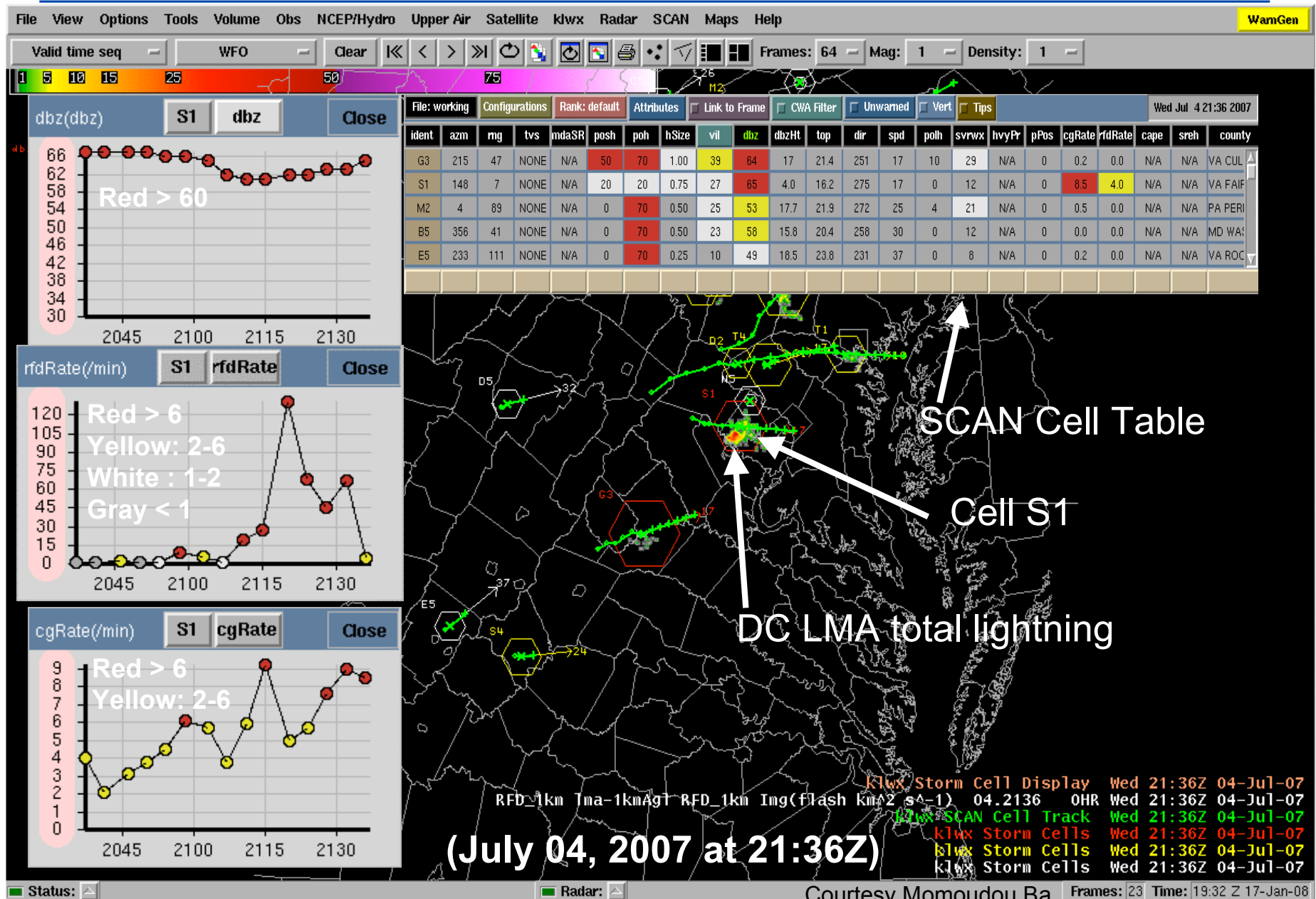GLM Testbeds at Huntsville, AL; Norman, OK; Sterling, VA; KSC, FL

GLM Proxy Data from OKLMA

GLM Lightning Jump Algorithm:
Experimental Trending Implementation in AWIPS/SCAN

(July 04, 2007 at 21:36Z)

Courtesy Momoudou Ba

Summary

- PG is the ultimate tool for user interaction
- Program Plan under development
- Phase I spin-up at CIMSS, CIRA (2008)
- Phase II adds SPoRT, AQ, Alaska, Pacific
    - HWT IOP with VORTEX-2 (2009)
- Must be able to test individual and integrated components with independence from developers
- Ensuring pathway into operations by developing GOES-R proxy products for the AWIPS2 environment
- Need real time and archived events (AWIPS2, WES)
- Must maintain focus on clear path to operations

Summary (Cont)

- Existing and Planned collaborations for product validation and assessment with NOAA Testbeds- HWT, JHT, DTC, HMT
- NESDIS Satellite Algorithm Testbed (new)- blended products from combining GEO and LEO observations, e.g.,
  - GOES-R ABI/GLM with NASA GPM
  - GOES-R ABI-derived soundings with NPP/NPOESS/METOP (CrIS, IASI)
- NOAA-EUMETSAT GEO Working Group
  - Advanced Sounders, Lightning Imagers
  - EUMETSAT Satellite Application Facilities (SAFs)
  - Visiting Scientists
- WMO WWRP Nowcasting Working Group
  - Forecast and Research Demonstration Projects (FDPs, RDPs, e.g., Sydney 2000, B08 and SNOW-V10 Summer and Winter Olympic Games)
  - WSN09 Nowcasting and Very-Short Range Forecasting Symposium, Whistler, BC, Canada

6th GOES Users' Conference

http://cimss.ssec.wisc.edu/goes_r/meetings/guc2009/

3-5 November 2009

Monona Terrace Convention Center

Madison, Wisconsin
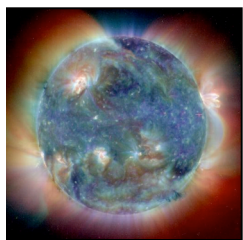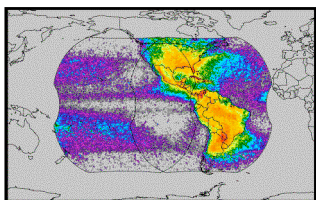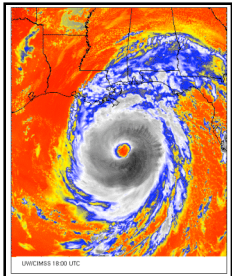
Geostationary Operational Environmental Satellites: http://www.goes-r.gov

Special Event on 2 November: 50th Anniversary of the 1st Meteorological Satellite